

Central Valley wetlands have experienced over a 95% reduction from historic extent. Though mostly managed wetlands remain, these areas are critical wintering grounds for migratory birds along the Pacific Flyway, even now supporting nearly 70% of the migratory ground for migratory birds along the Pacific Flyway. Wetlands in the central Valley are species rich and have probably supported the highest biomass of wildlife in California.

The loss of fresh emergent wetlands has substantially reduced the habitat of several plant and wildlife species. Some species being designated as California or federal special-status and threatened with local extermination. At least eight plant species, Suisun Marsh aster, California hibiscus, bristly sedge, Jepson's tule pea, Mason's lilaeopsis, marsh mudwort, Sanford's arrowplant, and marsh scullcap, are endemic to the Delta. Most of these plants are adapted to a complex tidal cycle and are typically found with more common vegetation such as tule, cattails, common reed, and a great diversity of other herbaceous plant species. Changes in habitat conditions have allowed the invasion of hundreds of non-native weedy plant species. Some of these species, such as water hyacinth, now clog waterways and irrigation ditches and reduce overall habitat quality for native plants and wildlife.

Over 50 species of birds, mammals, reptiles, and amphibians use fresh emergent wetlands in the Delta. Populations of some wildlife species that are closely dependent on fresh emergent wetlands, such as the California black rail, giant garter snake, and western pond turtle, have been substantially reduced in the Delta and designated as special-status species. A few wetland-associated species, such as waterfowl and egrets, have successfully adapted to foraging on some types of Delta croplands converted from historic wetland areas.

Isolating wetlands from tidal flows and removing Delta island fresh emergent wetlands changed the ecological processes that support wetlands. Removing the perennial water and vegetation from the organic soils of Delta islands resulted in soil oxidation and, subsequently, the subsidence of the interior islands. Loss of these tidal flow to islands has reduced habitat for native species of fish, plants, and wildlife; reduced water quality; and decreased the area available for floodwater dispersion and suspended silt deposition.

High water velocities in confined Delta channels continue to erode remaining fresh emergent wetland at a greater rate than habitat formation. Continued erosion reduces the amount of fresh emergent habitat changes the elevation of the land. Elevation affects the types of plant species that can grow depending on a species' ability to tolerate flooding. Flood protection and levee maintenance continue to impair wetland vegetation and prevent the natural reestablishment of fresh emergent wetlands in some locations.

Wind, boat-wake waves, and high water velocities in confined channels actively erode the soil needed to support remnant fresh emergent wetlands. Continued erosion of existing habitat, such as midchannel islands and levees and levee berms, is currently the primary cause of habitat loss in the Delta.



VISION

The vision is to increase the area and improve the quality of existing fresh emergent wetlands from degradation or loss and increase wetland habitat to assist in the recovery of special-status plant, fish, and wildlife populations, and provide high-quality habitat for other fish and wildlife dependent on the Bay-Delta.

Restoration of fresh emergent wetlands would focus on protecting and improving important existing wetlands, such as channel islands, and restoring wetlands in the Sacramento-San Joaquin Delta and Suisun Marsh/North San Francisco Bay Ecological Management Zones.

To prevent further loss of existing fresh emergent wetlands erosion rates must be reduced. Inchannel islands and levee berms are of particular concern. Erosion losses could be offset by allowing deposition and wetland establishment. Wetlands erosion could be reduced by reducing boat speeds where wetlands are subject to boat-wake-induced erosion (e.g., Snodgrass Slough). Constructing protective structures around eroding channel islands would weaken wave action (e.g., wave barriers and riprap groins) in a way that retains habitat value for fish and wildlife. Protecting inchannel islands from further erosion and connecting with larger islands would provide greater protection for this unique habitat.

Restoring fresh emergent wetland is dependent on local hydrological conditions (e.g., water depth, water

velocity, and wave action); land elevation and slope; and the types and patterns of sediment deposition. The approach to restoring fresh emergent wetlands would include:

- reestablishing the hydraulic, hydrologic, and depositional processes that sustain fresh emergent wetlands and inchannel islands;
- restoring a full spectrum of wetland elevations to allow the establishment of a greater diversity of plant species, including special-status species adapted to different elevations within the tidal or water (nontidal sites) column;
- providing a broader range of habitats for wildlife; and
- including wetland habitats throughout the Central Valley in the ERP focus area.

Restoration of fresh emergent wetlands would be coordinated with restoration of other habitats to increase overall habitat values. Restoration would also include reestablishment of the full diversity of fresh emergent wetland plant associations to ensure that the habitat needs of special-status and other species that are dependent on specific vegetation associations are met.

Protecting and restoring fresh emergent wetlands could be accomplished by implementing elements of existing restoration plans such as Central Valley Habitat Joint Venture; expanding State and federal wildlife areas to create additional wetland complexes; improving management of existing and restoring additional fresh emergent wetlands on private lands; and reestablishing connectivity between the Delta and Delta islands, and between channels with their historic floodplains.

LINK TO MSCS EVALUATED SPECIES

The MSCS has identified the following species as potentially benefitting from restoration of fresh emergent wetland habitat in the Bay-Delta system:

MSCS SPECIES INCLUDED IN THE ERPP

- giant garter snake
- Central Valley steelhead
- delta smelt
- winter-run chinook salmon
- California black rail

- Mason's lilaeopsis
- Sacramento splittail
- Central Valley fall-run chinook salmon
- Central Valley spring-run chinook salmon
- Suisun ornate shrew
- Suisun song sparrow
- Sacramento perch
- longfin smelt
- green sturgeon
- delta mudwort
- delta tule pea
- rose-mallow, and
- Suisun marsh aster.

OTHER SPECIES EVALUATED IN THE MSCS

- American peregrine falcon
- Aleutian Canada goose
- Central Coast steelhead
- tidewater goby
- white-tailed kite
- short-eared owl
- California gull
- northern harrier
- white-faced ibis
- grasshopper sparrow
- long-billed curlew, and
- western burrowing owl.

INTEGRATION WITH OTHER RESTORATION PROGRAMS

Fresh emergent wetland habitat use here is similar to the Goals Project (1999) designation of managed marsh, Madrone Associates (1980) description of freshwater marshes, Moyle and Ellison's (1991) description of valley marsh, and Cowardin's (1979) designation of emergent wetland.

Efforts to restore fresh emergent wetland habitat would involve cooperating with other wetland restoration and management programs. These include:

- Agricultural Stabilization and Conservation Service's Wetland Reserve Program,
- Wildlife Conservation Board's Inland Wetlands Conservation Program,
- restoration programs administered by Ducks Unlimited and the California Waterfowl Association,

- and ongoing management of State and federal wildlife refuges and private duck clubs.

Restoration efforts would be conducted in cooperation with agencies or organizations with responsibility or authority for restoring wetland and aquatic habitats, including:

- California Department of Fish and Game,
- California Department of Water Resources,
- U.S. Fish and Wildlife Service,
- U.S. Army Corps of Engineers,
- and the Delta Protection Commission.

LINKAGE WITH OTHER ECOSYSTEM ELEMENTS

Fresh emergent wetlands are linked to other ecological elements in the ERPP study area. This type of habitat contributes to the aquatic foodweb by supporting nutrient transformation. Fresh emergent wetland also provides habitat for many wildlife and plant species. Some of these are designated California or federal special status species.

Stressors that have reduced the extent of fresh emergent wetlands include flood protection practices, levee construction, and the loss of tidal flow. Increased water velocities in Delta channels causes erosion of wetlands and changes the elevation of the land. Wind and boat wake erosion also contribute to the loss of soil needed to support fresh emergent wetlands in areas where midchannel islands and levee berms are present.

OBJECTIVE, TARGETS, ACTIONS, AND MEASURES



The Strategic Objective is to restore large expanses of all major aquatic, wetland, and riparian habitats, and sufficient connectivity among habitats, in the Central Valley and its rivers to support recovery and restoration of native species and biotic communities and rehabilitation of ecological processes.

LONG-TERM OBJECTIVE: Restore fresh emergent wetlands in the Delta, Suisun Bay, Suisun Marsh, and San Francisco Bay to a substantial

fraction of their pre-settlement areas, or to a point where all at-risk species that depend on the habitats are no longer at risk.

SHORT-TERM OBJECTIVE: Inventory and prioritize for restoration diked former tidal marsh sites, develop techniques for restoration through implementation of pilot restoration projects, and begin implementation of large-scale manipulations of high-priority areas, especially on Delta islands.

RATIONALE: All major natural habitat types in the Delta, Suisun Bay, Suisun Marsh, and San Francisco Bay have been reduced to a small fraction of the area they once occupied, resulting in a large number of at-risk plant and animal species and an increased susceptibility of the remaining areas to irreversible degradation (e.g., invasion by non-native species). The reduction trend is continuing and will have to be reversed if self-sustaining examples of these habitats, and the diverse organisms they support, are to persist into the future. This reversal will require a large number of diverse and localized actions, from levee setbacks to land acquisition to better management of existing sites. The major habitat types to be restored include tidal shallow water habitat, freshwater emergent wetland, channel islands and associated habitats, tidal sloughs, nontidal freshwater emergent wetlands, seasonal upland wetlands, vernal pools and surrounding uplands, riparian forests and associated upland areas, perennial grassland, and inland dune scrub. In order to make restoration actions systematic and cost-effective, specific objectives need to be established for each of the habitat types, as well as subsets of them that have distinctive biological characteristics, and then priorities set within each objective for protection and restoration activities.

STAGE 1 EXPECTATIONS: A classification system for Delta, Suisun Bay, Suisun Marsh, and San Francisco Bay habitats that can be used as a basis for conservation actions will have been developed. Specific, numeric objectives should be formulated for each habitat type, with restoration objectives based on clearly stated conceptual models. Within and among habitat types, conservation and restoration activities should be prioritized. Work should begin on those projects given highest priority within a year of adoption of the strategic plan.

RESTORATION ACTIONS

The overall target for fresh emergent wetlands is to restore or recreate 30,000 to 45,000 acres in the Sacramento-San Joaquin Delta Ecological Management Zone.

Actions that would help restore fresh emergent wetlands include:

- Setbacks or breaches of island levees to allow water flows to reestablish wetlands with improved but limited ecological functions.
- Increase land elevations in the interior of Delta islands where subsidence has lowered land elevations below tidal emergent wetlands--
- Use substrate materials to create levee berms at elevations necessary for fresh emergent vegetation
- Modify, where consistent with flood control objectives, levee vegetation management practices to allow wetland vegetation to naturally reestablish.
- Reintroduce native wetland plants into suitable sites.

These protection and restoration strategies could be implemented by:

- establishing cooperative efforts between government and private agencies to coordinate the efficiency of implementing existing restoration strategies and plans;
- developing and implementing alternative land management practices on public lands to improve wetland habitat quality or promote habitat recovery, and provide incentives to private landowners to implement desirable land use practices;
- establishing additional incentive programs to encourage landowners to establish and maintain fresh emergent wetlands; and
- protecting existing habitat areas from potential future degradation through acquisition of conservation easements or purchase from willing sellers.

Restoration of stream meander belts and the process of overbank flooding along major tributaries to the Bay-Delta as proposed in the ERPP in other ecological management zones will also create the conditions necessary for the natural reestablishment of fresh emergent wetlands elsewhere in the Central Valley.

MSCS CONSERVATION MEASURES

The following conservation measures were included in the Multi-Species Conservation Strategy (2000) to provide additional detail to ERP actions to enhance or restore fresh emergent wetlands that would help achieve species habitat or population targets.

- To the extent consistent with CALFED objectives, direct ERP actions towards setting back levees in the south Delta to increase shallow water habitat.
- Restore and enhance delta smelt habitat to provide suitable water quality (i.e., low concentrations of pollutants) and substrates for egg attachment (submerged tree roots, branches, rock, and emergent vegetation) to spawning areas in the Delta: Barker, Lindsey, Cache, Prospect, Georgiana, Beaver, Hog, and Sycamore sloughs, and the Sacramento River in the Delta and tributaries of northern Suisun Bay.
- Coordinate protection, enhancement, and restoration of fresh emergent wetland habitats with other federal, state, and regional programs (e.g., USFWS recovery plans) that could affect management of current and historic habitat use areas to avoid potential conflicts among management objectives and identify opportunities for achieving multiple management objectives.
- To the extent practicable, design restoration of tidal habitat to create unvegetated, exposed substrate habitat for Mason's lilaeopsis at tidal margins of tidal fresh emergent wetland and riparian habitats.
- Direct ERP salt and freshwater marsh enhancement efforts towards existing degraded marshes that are of sufficient size and configuration that are large enough to develop fourth order tidal channels (marshes would likely need to be at least 1,000 acres in size).

- To the extent practicable, design salt and freshwater marsh enhancements and restorations to provide low-angle upland slopes at the upper edge of marshes to provide for the establishment of suitable and sufficient wetland to upland transition habitat. To the extent feasible, transition habitat zones should be at least 0.25 mile in width.
- To the extent practicable, control non-native predator populations in occupied habitat areas and salt and freshwater marshes enhanced and restored under the ERP.
- Identify and implement feasible methods for controlling invasive non-native marsh plants.
- Monitor to determine use of restored salt and freshwater marsh habitats by California black rails and the rate at which restored habitats are colonized.
- A substantial portion of tidal wetlands to be restored under the ERP should be restored in the North Delta (the Yolo Basin and Bypass) to benefit giant garter snake.
- Identify and implement opportunities to restore suitable wetland habitat within ERP nontidal freshwater marsh restoration actions.
- Consistent with CALFED objectives, create unvegetated, exposed substrate at tidal margins of restored and created tidal fresh emergent wetland and riparian habitat to benefit delta mudwort.
- To the extent consistent with ERP objectives, design and manage wetland habitat restorations and enhancements to provide suitable nesting and foraging habitat conditions for dependent species.

REFERENCES

- Cowardin, M.L., V. Carter, F. Golet, and E. LaRoe. 1979. Classification of wetlands and deepwater habitats of the United States. U.S. Department of the Interior. FWS/OBS-79/31. December 1979. 131 pp.
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◆ SEASONAL WETLANDS



INTRODUCTION

Bay-Delta seasonal wetlands include vernal pools, wet meadows or pastures, lands that are seasonally flooded, federal refuges, privately owned waterfowl hunting clubs, and private environmental refuge lands, and seasonally flooded areas within a stream course or its floodplain. Historically, seasonal wetlands occurred throughout the Central Valley. Vernal pools and wet meadows are probably best described as specialized components of terrestrial habitats. The remaining seasonal wetland types are flooded for periods that are too long to support characteristic upland vegetation.

Seasonal wetlands and aquatic habitats are important habitat areas for many species of fish and wildlife. Loss or degradation of historic seasonal wetlands has substantially reduced the habitat area available for waterfowl, shorebirds, and other wildlife. The loss of seasonal aquatic floodplain habitat has substantially reduced refuge habitat for fish and spawning habitat for the Sacramento splittail. Loss of vernal pools seasonally flooded shallow areas, in particular, has directly resulted in the listing of several species as threatened or endangered under the federal Endangered Species Act.

Major factors that limit the contribution of this habitat type to the health of the Bay-Delta are related to adverse effects of land conversion, and substantial reductions in seasonal overbank flooding.

RESOURCE DESCRIPTION

Vernal pools and wet meadows are associated with soils (basalt flow, claypan, hardpan, volcanic ash-flow, volcanic mudflow, mesa, and plateau) that maintain

standing water after winter and spring rains. In some areas of the Central Valley, high spring flows from the rivers and creeks saturate soils. Seasonal wetlands are created when puddles or small ponds form in depressions or standing water remains in low-lying grass fields after river flows recede. Although aquatic plants can establish in areas that are frequently flooded, upland plants cannot survive.

SEASONAL WETLANDS are included in two MSCS habitat descriptions: natural seasonal wetland and managed seasonal wetland. *Natural seasonal wetland habitat* includes vernal pools and other non-managed seasonal wetlands with natural hydrologic conditions that are dominated by herbaceous vegetation and annually pond surface water or maintain saturated soils at the ground surface for a portion of the year of sufficient duration to support facultative or obligate wetland plant species. Alkaline and saline seasonal wetlands that were not historically part of a tidal regime are included in natural seasonal wetlands. Natural seasonal wetland habitat includes portions of the ERP seasonal wetlands habitat. Managed seasonal wetland habitat includes wetlands dominated by native or non-native herbaceous plants, excluding croplands farmed for profit (e.g., corn and rice), that land managers flood and drain during specific periods to enhance habitat values for specific wildlife species. Ditches and drains associated with managed seasonal wetlands are included in this habitat type. Managed seasonal wetland habitat includes portions of the ERP seasonal wetlands habitat (Multi-Species Conservation Strategy 2000).

Wet meadows are grassy areas with saturated soils and standing water of varying depths that remain after winter and spring rains end. This habitat is conducive to the production of invertebrates. Invertebrates are the main food source of migrating waterfowl and other birds that periodically forage in these fields. Sandhill cranes forage and roost, and many ducks, geese, and shorebirds also commonly forage in wet meadows throughout the valley. During the dry seasons, many ground-nesting birds,

such as pheasants and meadowlarks, nest in meadow grasses. Most wet meadow habitat remaining in the Central Valley, now composed almost entirely of non-native grasses, is used as pasture for livestock.

Vernal pools are often referred to as hog wallows or ponds. These pools are common in grasslands in northern Central Valley where the natural geomorphology remains relatively unchanged. Many State- and federally listed plants (including vernal pool plants), invertebrates, and wildlife, including the western spadefoot toad, California tiger salamander, and various fairy shrimp, are native to or associated with vernal pools. In addition, a variety of birds, including migrating waterfowl, shorebirds, and ground-nesting birds such as meadowlarks, commonly use seasonal wetlands habitat.

Seasonal wetlands play a vital role in the natural succession of plant communities. Seasonal wetlands that maintain surface water for long periods may support cattails, bulrushes, and sedges. Historically, these emergent plant species were probably prevalent along natural stream courses where long-standing water reduced the ability of upland species to establish. These types of wetlands provide the essential building blocks for the future establishment of riparian scrub and eventually riparian woodland. Beyond the normal river flows, wetlands probably formed where rains and high flows left areas too wet for terrestrial plants to establish. These wetland areas provided high-quality habitat for waterfowl, other migratory birds, shorebirds, red-legged frogs, giant garter snakes, tricolored blackbirds, and many other wildlife species.

The continued existence of these seasonal wetland types is closely linked to overall ecosystem integrity and health. Although many species that use seasonal wetlands are migratory (e.g., waterfowl and sandhill cranes), many others have evolved (e.g., spadefoot toad, fairy shrimp, and many specialized plants) and adapted to seasonal wetlands.

The extent and quality of seasonal wetlands has declined because of cumulative effects of many factors, including:

- modification of natural geomorphology such as ground leveling for agriculture and development,
- adverse effects of overgrazing,
- contamination from herbicides,
- establishment of non-native species that have an adverse effect on native wetland plants and wildlife,
- flood control and water supply infrastructure that reduces overbank flooding and floodplain size, and
- reduction of the natural underground water table that supported wetlands.

Existing wetland regulations have been in effect for several years in an attempt to prevent the further loss of wetlands. The protected status of wetlands has resulted in an extensive permitting process for construction in wetland areas. Mitigation measures have been developed to offset loss of existing wetlands as a result of construction activities. These efforts have slowed the rate of wetland loss in many areas. Large-scale efforts in areas such as the Suisun Marsh, Grasslands Resource Conservation District, Yolo Bypass, and Butte Sink have been successful in maintaining and restoring seasonal wetlands.



VISION

The vision is to increase the area and improve the quality of seasonal wetlands by restoring ecosystem processes that sustain them and reduce the effect of stressors that can degrade the quality of seasonal wetlands in order to assist in the recovery of special-status plant and animal populations and provide high-quality habitat for waterfowl, water birds, and other wildlife dependent on the Bay-Delta.

Restoration of seasonal wetlands will focus on protecting and improving important existing wetlands, reestablishing vernal pools within and adjacent to existing ecological reserves, and restoring seasonal wetlands in the Sacramento-San Joaquin Delta and Suisun Marsh/North San Francisco Bay Ecological Management Zones. Seasonal wetland restoration will be coordinated with restoration of other habitats, including shallow-water and riparian woodland and scrub. Restoration would include reestablishment of the full diversity of seasonal wetland plant associations to ensure that the habitat needs of special-status and other species that are dependent on specific vegetation associations are met.

LINK TO MSCS EVALUATED SPECIES

The MSCS has identified the following species as potentially benefitting from restoration of seasonal wetland habitats in the Bay-Delta system.

MSCS SPECIES INCLUDED IN THE ERPP

- giant garter snake
- California red-legged frog
- California tiger salamander
- greater sandhill crane
- Swainson's hawk
- western spadefoot
- western pond turtle
- Delta green ground beetle
- mad-dog skullcap
- alkali milk-vetch
- recurved larkspur
- Boggs Lake hedge-hyssop
- Contra Costa goldfields
- Legenere
- Colusa grass, and
- Crampton's tuctoria.

OTHER SPECIES EVALUATED IN THE MSCS

- American peregrine falcon
- white-tailed kite
- tricolored blackbird
- short-eared owl
- California gull
- long-billed curlew
- norther harrier
- Conservancy fairy shrimp
- longhorn fairy shrimp
- Mid-valley fairy shrimp
- vernal pool fairy shrimp
- vernal pool tadpole shrimp
- grasshopper sparrow, and
- western burrowing owl.

INTEGRATION WITH OTHER RESTORATION PROGRAMS

Efforts to restore seasonal wetlands would involve cooperation with other restoration programs, including:

- Upper Sacramento River Fisheries and Riparian Habitat Council,
- Suisun Marsh Protection Plan,
- California Department of Fish and Game wildlife areas,
- U.S. Fish and Wildlife Service refuges,
- Jepson Prairie Preserve,
- Ducks Unlimited Valley Care Program,
- California Waterfowl Association,
- Cache Creek Corridor Restoration Plan,
- The Nature Conservancy,
- Putah Creek South Fork Preserve,
- Woodbridge Ecological Reserve,
- Yolo County Habitat Conservation Plan, and
- Central Valley Habitat Joint Venture.

LINKAGE WITH OTHER ECOSYSTEM ELEMENTS

The description of seasonal wetland here is similar to the Goals Project (1999) description of grassland/vernal pool complex, Moyle and Ellison's (1991) floodplain pool and vernal pool classifications, Madrone Associates (1980) description of vernal pools, and Cowardin's (1979) classifications for seasonally flooded and intermittently flooded wetlands.

Seasonal wetlands are linked to other ecosystem elements in the ERP Study Area. Seasonal wetlands include wet meadows or seasonally flooded pastures, vernal pools, and federal, State, and privately owned refuges and hunting clubs. This habitat supports many species and communities of wildlife and plants.

The health and extent of seasonal wetlands is adversely influenced by land use, herbicide application, proliferation of non-native plant species, flood control practices, and lowering of ground water tables.

OBJECTIVES, TARGETS ACTIONS, AND MEASURES



One Strategic Objective for seasonal wetlands is to restore large expanses of all major aquatic, wetland, and riparian habitats, and sufficient connectivity among habitats, in the Central Valley and its rivers to support recovery and restoration of native species and biotic communities and rehabilitation of ecological processes.



Another Strategic Objective for seasonal wetlands is to restore large expanses of all major habitat types, and sufficient connectivity among habitats, in the Delta, Suisun Bay, Suisun Marsh, and San Francisco Bay to support recovery and restoration of native species and biotic communities and rehabilitation of ecological processes.

LONG-TERM OBJECTIVE: Restore, protect and manage, throughout the watershed, multiple large areas of seasonal wetlands in association with other aquatic, wetlands, and riparian habitat types in the Central Valley and its rivers to a point where the wintering needs of waterfowl and shorebirds are met and all at-risk species that depend on the habitat are no longer at risk.

SHORT-TERM OBJECTIVE: Conserve the best examples of seasonal wetlands, particularly in the Bay-Delta, begin implementation of action plans for restoring significant, large areas of seasonal wetland.

RATIONALE: Restoring seasonal wetlands in combination with other wetland habitat types will help restore and maintain the ecological health of aquatic and terrestrial resources in the Delta and other areas of the Central Valley. Foodweb processes will be supported and the effects of contaminants reduced. Seasonal wetlands will provide high quality foraging and resting habitat for wintering waterfowl, greater sandhill cranes, and migratory and wintering shorebirds. Restoration of seasonal wetlands will occur as a by product of restoring floodplain processes in a manner that improves spawning habitat for fish species such as splittail while avoiding concurrent increases in non-native predatory fish. Furthermore, restoring other wetland habitats in the Delta, such as tidal emergent wetland and tidal perennial aquatic habitat, can reduce habitat values for species such as waterfowl and the State listed greater sandhill crane. Increasing seasonal wetlands in the Delta will ensure that any adverse impacts associated with those habitat losses will be fully mitigated.

Each habitat, including seasonal wetlands, supports a different assemblage of organisms and quite likely many of the invertebrates and plants are still unrecognized as endemic forms. Thus systematic protection of examples of the entire array of habitats

in the region provides some assurance that rare and unusual aquatic organisms will also be protected, preventing contentious endangered species listings.

STAGE 1 EXPECTATIONS: Several large seasonal wetland projects will be initiated in the Delta. At least two of the projects will be associated with floodplain process restoration projects. At least two projects will be associated with restoring seasonal wetlands in heavily subsided areas where land elevations are too low to support actions to restore aquatic habitat.

RESTORATION ACTIONS

The general target for seasonal wetland habitat is to restore 30,000 acres in the Sacramento-San Joaquin Delta Ecological Management Zone and 1,000-1,500 acres in the Suisun Marsh/North San Francisco Bay Ecological Management Zone.

The following actions would help protect and restore seasonal wetlands:

- implement existing restoration plans;
- expand State and federal wildlife areas to create additional wetland complexes;
- improve management of existing wetlands and restore seasonal wetlands on private lands; and
- reconnect channelized streams and rivers with their historic floodplains.

The following actions would help implement protection and restoration strategies:

- establish cooperative efforts between government and private agencies to coordinate the efficiency of implementing existing restoration strategies and plans;
- develop and implement alternative land use practices that will protect grasslands containing vernal pools and wet meadows and allow existing, compatible land uses, such as grazing, to continue;
- develop and implement alternative land management practices on public lands to improve seasonal wetland habitat quality or promote habitat recovery, and provide incentives to private landowners to implement desirable land use practices;

- establish additional incentive programs to encourage landowners to establish and maintain seasonal wetlands;
- protect existing habitat areas from potential future degradation through acquisition of conservation easements or purchase from willing sellers; and
- set back or breach levees and dikes to create the hydrologic conditions necessary for establishing seasonal wetland vegetation.

Restoration of stream meander belts and the process of overbank flooding along major Bay-Delta tributaries proposed in the ERP in other ecological management zones will also create the conditions necessary for the natural reestablishment of seasonal wetlands elsewhere in the Central Valley.

MSCS CONSERVATION MEASURES

The following conservation measures were included in the Multi-Species Conservation Strategy (2000) to provide additional detail to ERP actions to enhance or restore seasonal wetland habitat that would help achieve species habitat or population targets.

- To the extent practicable, design restored seasonal wetlands in habitat areas occupied by Swainson's hawk to provide overwinter refuge for rodents to provide source prey populations during spring and summer.
- Incorporate restoration of permanent or seasonal flooded (April-October) suitable habitat areas for giant garter snake as part of a mosaic of the seasonal wetland and agricultural land enhancements to be implemented under the ERP.

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